APPLICATION FOR UNITED STATES PATENT

TILTING DECK LAWN MOWER

BACKGROUND OF THE INVENTION

This invention relates to lawn mowers and more particularly to commercial mowers with multiple-blade wide decks, which can be tilted vertical for passage through limited space areas.

Commercial lawn mowers like farm tillage equipment are always attempting to achieve a wider cutting swath as for example, some farm tillage implements when in use are substantially wider than the roads they utilize for transport. To achieve this narrower transport width, a variety of different designs have been used in the prior art. Farm implements typically fold-up sections of the tillage implement upon themselves during transport. The same concepts are used in grass mowing equipment to a lesser scale as typified in U.S. Patent No. 3,473,302 to Caldwell which illustrates a series of deck sections which fold up during transport while leaving a center section of the deck in place. Also see U. S. Patent No. 5,249,411 to Hake, with a similar deck design.

The present invention is specifically directed to a walk-behind commercial unit having a four blade single deck design. In walk-behind mowers and smaller riding mowers, the typical way to reduce deck width for passage through gates and limited spaces is to hinge one section of the deck so that it may be tilted to a vertical position such as that taught in U.S. Patent No. 6,308,503 to Scag. Other variations of partial tilting sections are widely used as for example U.S. Patent No. 5,463,853 to Santoli et al.

The only patent discovered that tilts the entire deck in one piece, is U.S. Patent No. 4,779,406 to Schroeder, which tilts the deck about a lateral axis so that the underside of the deck is accessible for maintenance and cleaning which has no impact on deck width.

SUMMARY OF THE INVENTION

The present invention effectively tilts a multiple-blade single deck to a vertical position that effectively renders the mower no wider than the drive wheels on the tractor portion of the mower. The mower deck is supported from a carrier frame which is pivotally connected to the tractor frame about a horizontal longitudinal extending axis which when fully elevated, basically stands the carrier frame and deck on end. Since the pivot point for the rotation of the carrier frame and deck is not positioned on the outer edge of the carrier frame, it is necessary to lift the deck with respect to the carrier frame as the carrier frame commences its rotation so that the lower edge of the deck does not drag on the ground. This deck lifting relative to the carrier frame is caused by a deck lift crank, that carries a cam roller on the end thereof engaging a camming surface through a series of lift arms and links which draws the deck upward in close proximity to the carrier frame so as to clear the ground as the carrier frame and deck begin their tilting action. A similar linkage also lifts the grass deflection chute when the deck approaches the vertical position

The walk-behind mower unit is of a standard configuration utilizing two drive wheels on the tractor frame which are each driven by a separate hydrostat pump and motor at different speeds so as to achieve steering, while a pair of caster wheels are positioned on the front of the mower which provide the necessary four wheel support for positioning the

mower relative to the ground surface. When rotating the carrier frame and deck upward, the outer caster wheel of course is lifted off the ground leaving the inner caster wheel in engagement with the ground which is necessary for supporting the mower on at least three wheels. The inner caster wheel is mounted on a support rod that is journaled within the carrier frame so that it rotates relative to the carrier frame. This caster wheel support rod is connected to a parallelogram linkage with one pivot point on the linkage connected to the stationary tractor frame so that as the deck and carrier frame are rotated upward, the caster wheel support rod does not rotate and it remains properly aligned with the ground so that the overall mower is supported with the deck in the fully elevated position. This permits the mower to be driven in a three-wheel transport configuration or in a typical moving configuration.

Therefore, its principal object of the invention is to provide a wide-cut mower that can be driven under its own power through narrow gate areas.

A further object of the present invention is to provide a walk-behind mower that can be driven on a three-wheel configuration with the cutting deck fully elevated in a vertical position.

Another object of the present invention is to provide a tilting deck walk-behind mower which can be readily unlatched in a matter of seconds and lowered to its operating configuration with a very minimal time loss between its transport folded position and its operative position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a self-propelled walk-behind mower having a mowing deck positioned in its horizontal operating position;

FIGURE 2 is a front elevational view of the carrier frame and cutting deck in symbolical form illustrating the parallelogram linkage for maintaining the caster wheel support shaft in a ground engaging position as the carrier frame and deck are rotated;

FIGURE 3 is a front elevational view of the linkage for lifting the deck relative to the carrier frame also symbolically shown;

FIGURE 4 is a front elevational view of the carrier frame and deck and the respective linkages with the deck in the horizontal working position;

FIGURE 5 is a similar front elevational view to Figure 4 with the deck elevated at 20° illustrating the positions of the various linkages and cams.

FIGURE 6 is a front elevational view similar to Figure 4 with the carrier frame and deck in the fully elevated 90° tilt position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Present invention is directed to a self-propelled walk-behind lawn mower having a mower deck supported by a carrier frame which is fully rotatable to a vertical non-operating position so that the mower can travel through narrow gates and passageways to an enclosed mowing area in a three-wheel configuration.

Referring to Figure 1, a walk-behind self-propelled lawnmower is generally described by reference numeral 10 in accordance with the preferred embodiment of the

present invention. The tractor portion of the mower 10 is mounted on frame 12 and is of the conventional drive wheel steering type of unit well known in the prior art wherein each of the two drive wheels is separately driven by a variable flow pump and motor from a common power source. The steering handles 50 control the speed of the two separate drive wheels thus creating the steering while the front caster wheels 20 and 21 merely support the front of the mower 10. These types of hydrostatic units can also be zero turn radius units if desired wherein one drive wheel can rotate forward while the other rotates backward at the same speed, thus causing the mower to turn about a central axis of the tractor. The details of the drive system and steering control are not shown in detail and are well known in the prior art in various forms. The mower deck 14 is supported by a carrier frame 16 which is pivotally connected to the tractor frame 12 about a horizontal longitudinal axis 18 as shown in Figures 2 and 3 which axis is parallel to the direction of travel of the mower. The deck 14 is connected to the carrier frame 16 as shown in Figures 2 and 3 by chain 58. Deck 14 can be moved relative to carrier frame 16 by two means, the first being a manual crank 52 as shown in Figure 1 and the second being a cam actuated deck lift linkage that is shown in Figure 3. Manual crank 52 is used to set the specific grass cutting height of the mower when in use. The cam operated deck lift linkage in Figure 3 can override the manual hand crank 52 setting.

In viewing Figure 3, the cam operated deck lift linkage is shown in symbolic form. The carrier frame 16 and deck 14 are of both rotatably mounted about pivot 18, which mounts to the tractor frame. The arcuate cam surface 28 is followed by a cam roller 31 which in turn, is mounted on a crank 30 which rotates about axis 33. Also integral with

crank 30 are a pair of arms 34 and 35 which lift deck 14. Actuating rod 32 connecting arm 35 to arm 36 causes both sides of deck 14 to lift at the same rate. Cam 28 which is mounted on the tractor frame 12 is stationary so that as the carrier frame begins to rotate in a counter-clockwise direction, cam roller 31 will be forced to ride up over the hump 29 in cam surface 28. This will cause crank 30 to rotate in a clockwise direction about axis 33, thus raising deck 14 up towards carrier frame 16. Once the cam follower 31 passes the hump on the cam, the remaining cam surface is concentric with the rotational axis 18 thus holding the deck in its elevated position as illustrated in detail in Figures 5 and 6.

As the carrier frame 16 and deck 14 begin to rotate upward, caster wheel 21 comes out of contact with the ground and no longer functions. Caster wheel 20 is mounted on support rod 22, and in turn is journaled in carrier frame 16. Located on the rear end of rod 22 is a fixed link 24 as shown in Figure 2, which is pivotally connected to a parallel link 26 which in turn is pivotally connected to the stationary tractor frame 12.

In viewing Figure 2, as the carrier frame 16 and deck 14 begin to rotate counter-clockwise about pivot 18, the parallelogram linkage 24 and 26 causes caster support rod 24 to remain in its non-rotating position as shown in Figure 2, even though the carrier frame and deck are rotating upward in a counter-clockwise direction. Rigid shafts 38 mounted on deck 14 as seen in Figure 2 are slidably received in bushings 40, thus preventing any lateral movement between carrier frame 16 and deck 14. Caster wheel 20 remains in contact with the ground as the carrier frame and deck rotate by reason of the parallelogram linkage previously discussed. Figure 4 illustrates the deck 14 in its operative position with both caster wheels 20 and 21 supported on the ground. Locking latch mechanism 42 holds the

carrier frame in its horizontal operating position. Latch handle 48 is pulled upward in a counter-clockwise direction thus forcing link 46 over a dead center position with link 44, thereby releasing carrier frame 16 for rotation about axis 18. When deck 14 is fully tilted to its vertical position as seen in Figure 6, hook 49 mounted on the tractor frame is engaged by locking latch 42 through clockwise rotation of handle 48 as seen Figure 6, thereby locking deck 14 in its elevated position. In comparing Figure 4 with Figure 6, the change in distance A between the carrier frame 16 and deck 14 is readily apparent since cam roller 31 is held up by the concentric portion of cam 28 as seen in Figure 6.

When lowering the deck 14 back to its horizontal working position, as the deck and carrier frame swing through the 20° tilted position of Figure 5, cam roller 31 rides over hump 29 on the cam surface, thus allowing the deck to drop down to its operative position as seen in Figure 4.

While the invention as been described with reference to the preferred embodiments , those skilled in the art will appreciate the certain substitutions, alterations, and admissions may be made without departing from the spirit of the invention. Accordingly, the foregoing description is meant to be exemplary only and should not limit the scope of the invention set forth in the following claims.

What is claimed is: